Lunar Flywheel weekly meeting- Minutes

Wednesday; November 2, 2016; 3:30pm

Present: Dr. Herb Hess, Dr. Feng Li, Justin Pettingill, David Arnett, Nick Bachus, Matt Phillips, Kyle Petersen, Cooper Atkinson, Ian Tanimoto, Brian Cartwright, Shea Morrison, Andrew Jones

Absent: None

Late: None

GJ 218 Conference Room

Moderator: Nicholas Bachus

Minutes: Brian Cartwright

Updates:

- Stator Design Team:
    - Electrical Team
        - Figured out permeability error; units confusion. After conversion to correct units, the results make sense.
        - New toroid was about 5/10ths higher than previous
        - Exact results to be uploaded to the OneDrive
        - Starting research into quadratures.
    - Mechanical Team
        - Fatigue TK code: recently done code for inner diameter <-> heat transfer, and force <-> outside diameter. Want to expand further to incorporate keyholes, step locations, etc. Determining stress intensity. Gut feeling: it'll be fine. Want to combine with heat transfer calculations.
        - The use of a shaft in the High-speed Flywheel is debated. Dr. Hess proposes a shaftless design: laminations provide structure, thin coating between coolant and windings, material would need to have high thermal conductivity and be non-ferrous. Potentially smaller inner radius as a benefit.
        - Heat transfer calculations ongoing, modeling stator teeth and rotor chevrons as fins. End result should be usable in simulations to verify.
        - Review cooling caps: Pros: higher efficiency, Cons: More complex, a bit overkill. Probably only need the single-bore shaft-cooling since it stays room temp.
          If there is too much heat, it's a good idea. Thermal paste could help. 100W was the given ballpark heat losses, probably worst-case scenario. ~50W is realistic.
- Controls Team:

- Looking into dual-core capabilities of the 77D microcontrollers. May potentially offload one of the other processors' workloads onto the 77D/79D. Also, 7xD has CLAs, more offloading is possible.
    - ControlSUITE may have example code taking advantage of this. Most of it is probably under the GNU open license.

Update from mentors (Justin and David):

- Justin
    - Talking with Berven about purchasing ANSYS for analytical models for stress concentrations, especially the chevrons. Currently using ANSYS student version, which is free but not publishable. Will request quotes.
    - Working on validating Brenden's model, so far it looks valid to within 1 or 2%.
    - Dillon will be doing Maxwell equations for halbach arrays, might be similar software
- David
    - Needs for the current machine to operate:
        - 1.1-1.2 tesla range is their operating/saturation point
        - d: bias current 1.75 amps +- 0.7A control
        - q: 1.67A (these figures are in the theses tables)
        - sizing power supply- assume sum of each
        - 2.6A bias current +-1A control signal
        - still looking into power electronics configuration
    - Remember saturation for stator design
    - In initial stages of paperwork for getting room in the IRIC. More info next week. People in general start moving in January 1st.

Update from weekly Tuesday Meeting with Dr. Berven

- Showed Dr. Berven cap simulation results, she says proceed with single-bore. She approves of heat analysis techniques.
- We have videos of the setup in action, Brian will post on OneDrive.

Other Updates:

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Senior Design Items:

- Wikis are due 5pm the 4th, email when done.
- Scheduling stator design's design review
    - Data sheets, real things are good, keep PowerPoint minimal. Combinations are good.
- Ian and Dr. Hess still need to fill out Control team scheduling doodle poll.
- Design review level of detail from Dr. Hess:
    - What you're doing
    - What your task is

    - What you've done so far
    - "How you plan to land this thing."
    - Any issues you need to discuss
    - "Circuit diagrams labeled with numbers are great."
    - "Prove you've gotten as far as you've got. Don't let me believe you haven't done anything."
    - In this case, background information should be minimal.
- Scheduling group picture after class Friday.